

# Pumps and their Installation

## INTRODUCTION

Buildings of various heights are constructed for both commercial as well as residential purposes. The heights of these buildings vary from 15 to 1,000 feet. Water is carried with the help of water pumps fitted at the base of the building. A pump is a device that moves fluids (liquids or gases), or sometimes slurries, by a mechanical action.

## TYPES OF PUMPS

### Airlift Deep Well Pumps

These reliable and durable pumps are often used in deep dirty wells where the sand is acidic and alkaline. They are also used where simple pumps do not work as they collect more water. The compressed air enters the bottom of the pump and lifts the water above the well.

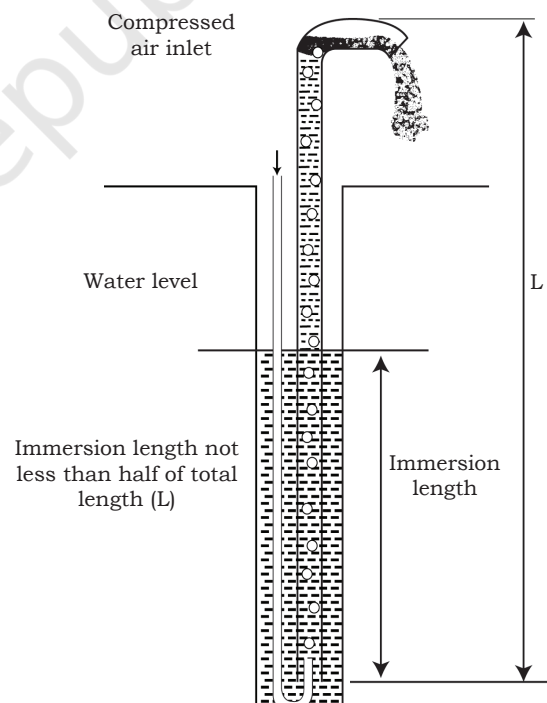


Fig. 4.1: Airlift deep well pump

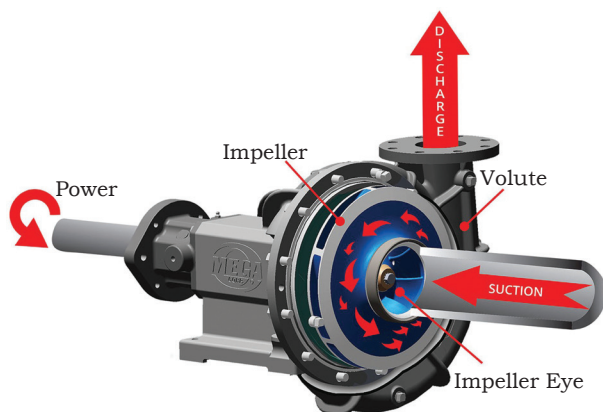


Fig.4.2: Centrifugal pump

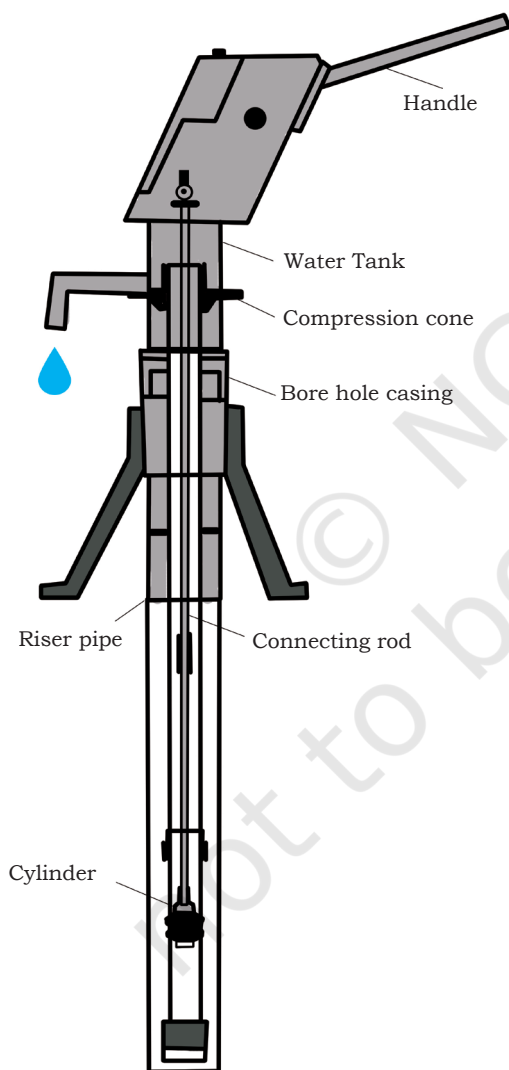


Fig.4.3: Reciprocating pump

## Centrifugal Pump

These pumps are more useful than other pumps and work on the principle of centrifugal force. They are used to take water and other liquid to a higher level. These pumps are placed where less space is available. The initial fixing cost and operational cost is low and efficiency is satisfactory. These pumps are easy to operate and place and are available in many ranges and capacity. They neither have a discharging sound or a valve. They are available in single stage and multistage. Centrifugal pumps are cast in iron and have a steel shaft, bronze sleeves, cast iron impeller or cast iron vanes. Sometimes the impeller and vanes are in bronze.

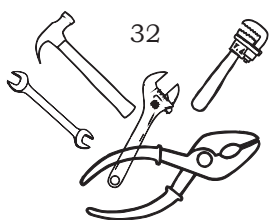
## Reciprocating Pump

This is called a handpump and are mainly used for domestic works. They are often used where a relatively small quantity of liquid is to be handled and where the delivery pressure is quite big.

## Jet Well Pumps

They circulate water in loop systems and are available in several horsepower (HP) options for different pumping performance rates. Jet well pumps are mainly used in low capacity installation. They deliver water and water pressure to a household, cottage or small sprinkler systems.

**(a) Shallow Well Jet Pumps:** They are used when the pump is located above the water source, drawing water from a depth of 25 feet or less, vertically. They use a single suction pipe to draw from wells or surface water.



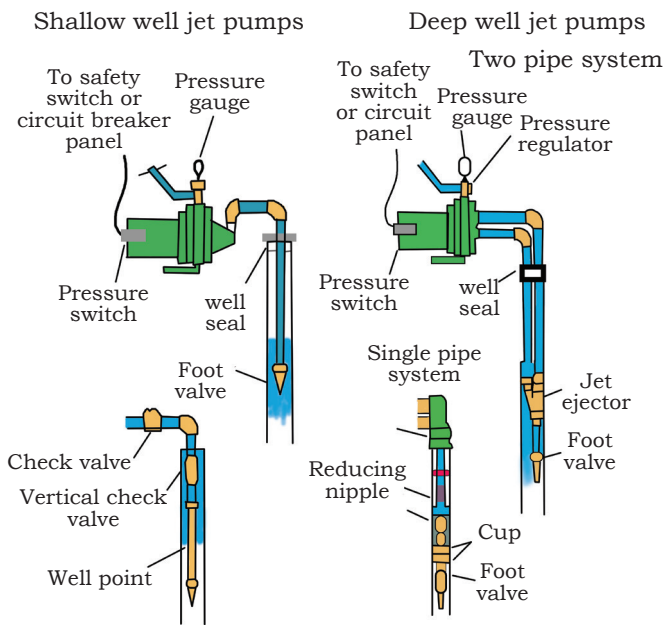


Fig. 4.4: Different types of jet well pump

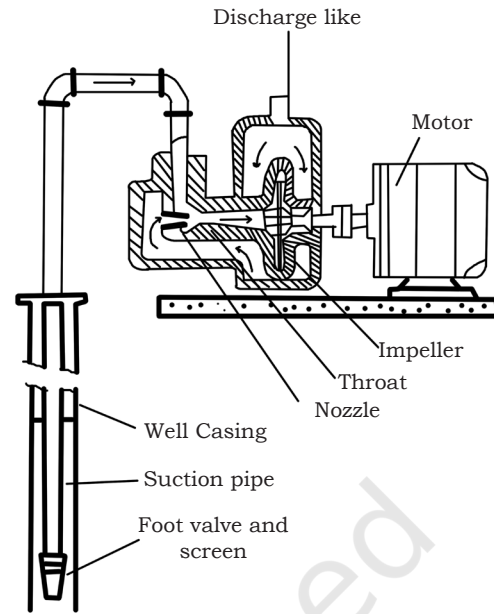


Fig.4.5: Convertible jet pumps

**(b) Deep Well Jet Pumps:** They are used when the pump is located above the water source, drawing water from a depth of 25 feet to 110 feet vertically.

**(c) Convertible Jet Pumps:** They are used for deep wells when installed with a jet assembly, built-in or attached to the pump. They are used when the pump is located above the water source, drawing water from a depth of 110 feet or less, vertically. They use two pipes on the suction side to draw water from wells. They are mainly used for household water supply from a well, driven point system, or open water source. Pumps should be used with a standard or pre-charged pressure tank.

These pumps are mainly used to draw a lot of water, oil or liquids.

## Rotary Pumps

In rotary pumps two gears are placed. These gears rotate from the centre. They do not have a valve and do not lift water where sand

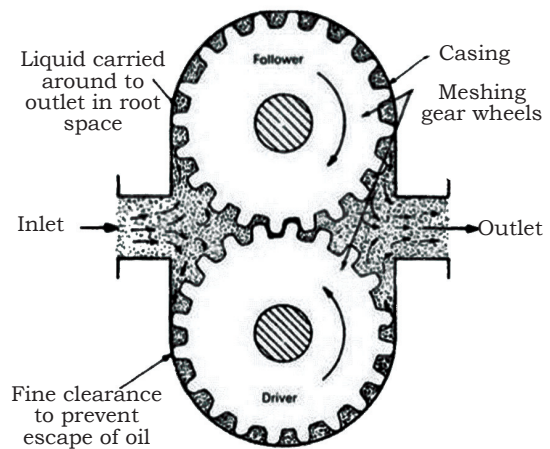
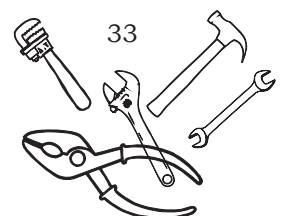


Fig.4.6: Rotary pumps



and silt are mixed in water. Their capacity to pump water totally depends on the tightening of their body. They pump water without any obstruction and low maintenance cost. Their work capacity is 60 to 80 per cent.



Fig. 4.7: Water Meter

## WATER METER

Water metering is the process of measuring water use. The purpose of meter is to measure the quantity of water consumed by a building. There are different types of meters to measure different quantities of water.

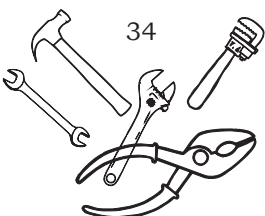
For example, a 15mm size meter measures 2000 litres of water per hour, while a 50mm size of water meter can measure 15,000 litres water per hour.

### Advantages

1. This quantifies the amount of water consumed by the people.
2. In conjunction with volumetric pricing, it provides an incentive for water conservation.
3. It helps to detect water leaks in the distribution network, thus providing a basis for the reduction of non-revenue waste.
4. It is a precondition for quantity — targeting water subsidies to the poor.
5. Quantity consumed is generally regarded as the fairest way to pay.
6. This provides a strong signal to users to manage water consumption and reduce wastage.
7. Helps to detect leakage.

### Disadvantages

1. Uncertainty over to which extent meters actually reduce consumption. The evidence for optional metering in particular is inconclusive, and



metered customers may be less likely to reduce consumption during times of drought.

2. Potential impacts on affordability, since less well-off customers may limit their use to save money with a consequent risk to health or hygiene. There is a tension between pricing to encourage customers to use water wisely and making water affordable for all.
3. The difficulty of individually metering some properties, such as those with a shared supply.
4. The historic cross subsidy, where the cost of metering has been shared amongst non-metered customers, is gradually exposed. This leaves a smaller proportion of the remaining unmetered customers paying a higher cost.

## TYPES OF WATER METERS

There are various types of water meters, which are selected on the basis of requirement of the place. Some of these are as given below.

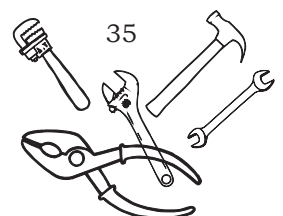
### Gear Type Water Flow Meter

Generally, all residential water meters are of positive displacement type. Displacement water meters measure how much water occupies a given space over a preset time. These can in turn be gear meter or oscillating piston or nutating disk meter-type. Here, the water is made to enter into a chamber from which it is let out only when the chamber fills-out. By doing so, one can estimate the rate of flow of water. These meters are used when the water flows at a moderately low rate.

### Velocity Water Meter

In these meters, the rate of flow of water is determined by monitoring the speed at which the water flows. Jet-type water meters are suitable for low flow rate measurements, while turbine-type flow meters are suitable when flow rates are high.

## NOTES



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### Electromagnetic Water Meter

Water meters can also measure the flow rate of water by using Faraday's law of induction. Such meters are referred to as electromagnetic water meters and are usually used when one needs to measure unclean or untreated or waste water.

### Transit Time Type Water Meter

Water meters can also be of ultrasonic type in which the rate of water flow is measured by using SONAR technique. Here the sound waves are sent through the flowing water to measure its velocity. Once velocity is known, one can determine the associated rate of flow of water as the cross-sectional area of the meter body would be known in prior.

## Practical Exercises

### Activity 1

Draw the diagram of pumps

#### Material required

- |         |               |
|---------|---------------|
| 1. Pen  | 2. Pencil     |
| 3. Copy | 4. Water pump |

#### Procedure

1. Identify the water lifting pump at home or school.
2. Identify the components of pumps.
3. Discuss with your classmates regarding components of the pump.
4. Draw the figure of the pumps.

### Activity 2

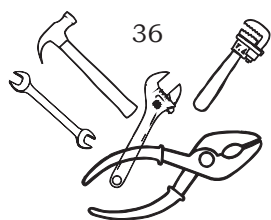
Visit to the community water storage tank

#### Material required

- |         |               |
|---------|---------------|
| 1. Pen  | 2. Pencil     |
| 3. Copy | 4. Water pump |

#### Procedure

1. Teacher will identify water storage in school area.
2. Teacher will take permission from Principal and in charge of water storage tank for visit.
3. During the visit student will note the different type of pump.
4. Note down the different types of water tank storage capacity, etc.



**Activity 3**

Measuring the water meter reading

**Material required**

1. Water Measuring meter
2. Copy
3. Pen
4. Pencil
5. Stop watch

**Procedure**

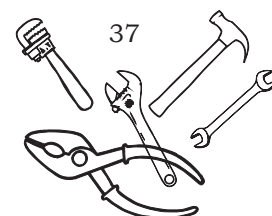
1. Visit a site where water meters are fitted.
2. Identify the components of the water meter.
3. Read the reading of the water meter.
4. Note down the water meter reading.
5. Discuss with friends and teachers about the water meter.

**Check Your Knowledge****A. Short answer questions**

1. Differentiate between shallow jet well pumps and deep well pumps.
2. List the advantages and disadvantages of installing a water meter.
3. Draw the parts of centrifugal pumps.

**B. Multiple choice questions**

1. Water pumps are used to \_\_\_\_\_.  
 (a) lift the water  
 (b) carry the water  
 (c) transfer the water  
 (d) All of the above
2. Which of these pumps work on the principle of centrifugal forces?  
 (a) Deep pump  
 (b) Lift pump  
 (c) Centrifugal pump  
 (d) None of the above
3. Reciprocating pump is used for \_\_\_\_\_.  
 (a) domestic work  
 (b) industrial work  
 (c) mass work  
 (d) None of the above
4. Deep well jet pumps draw the water from a depth of \_\_\_\_\_.  
 (a) 25 to 50 feet  
 (b) 25 to 90 feet



- (c) 25 to 100 feet
  - (d) 25 to 110 feet
5. How many gears are placed in a rotary pump?
    - (a) 2
    - (b) 4
    - (c) 5
    - (d) 6
  4. Which of the following pumps are also known as hand pumps?
    - (a) Centrifugal pumps
    - (b) Reciprocating pump
    - (c) Airlift deep well pump
    - (d) Jet pump

**C. Fill in the blanks**

1. A pump is a device that moves fluids, slurries by a \_\_\_\_\_.
2. Shallow well jet pump draw water from a depth of \_\_\_\_\_ feet.
3. Water meter is used to measure the consumption of water in a \_\_\_\_\_.
4. A centrifugal pump is used for transferring the \_\_\_\_\_.
5. Positive displacement meters are \_\_\_\_\_ common for homes and small business.

